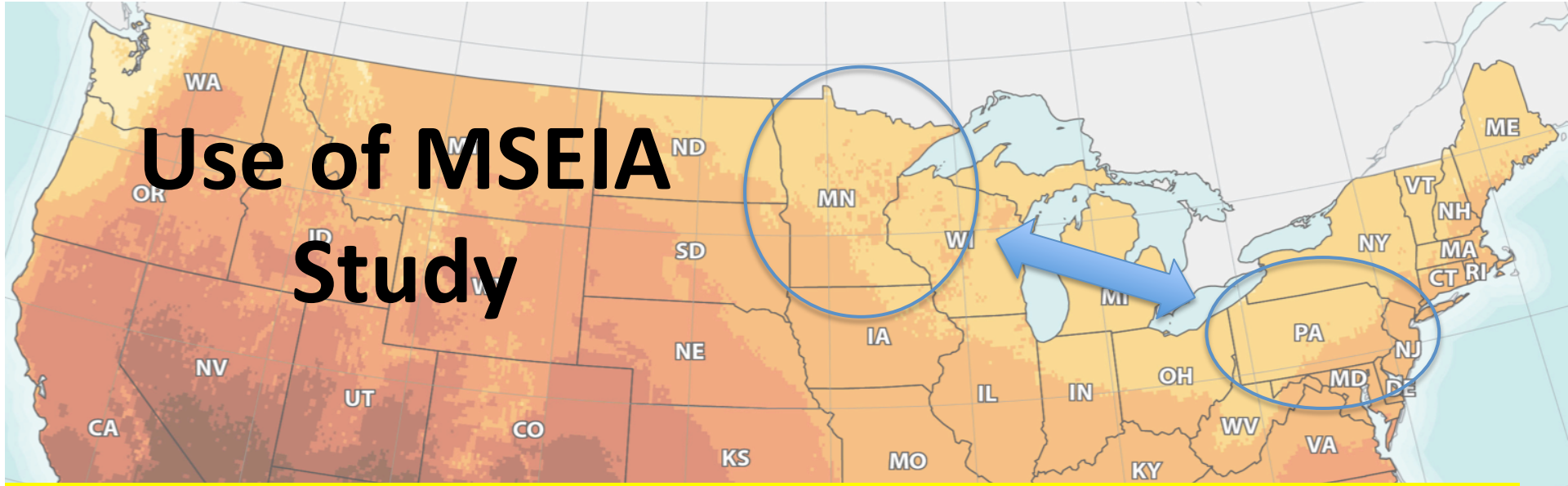
ENVIRONMENTAL LAW & POLICY CENTER
Protecting the Midwest's Environment and Natural Heritage

THE Vote Solar INITIATIVE

Fresh Energy

Value Components

Use of MSEIA Study



	Pittsburgh	Harrisburg	Scranton	Philadelphia	Jamesburg	Newark	Atlantic City
Energy							
Fuel Cost Savings	$41	$41	$41	$38	$42	$39	$41
O&M Cost Savings	$20	$20	$20	$18	$21	$19	$20
Total Energy Value	$61	$60	$60	$56	$63	$58	$61
Strategic							
Security Enhancement Value	$23	$23	$23	$22	$23	$22	$22
Long Term Societal Value	$28	$29	$29	$27	$28	$28	$28
Total Strategic Value	$51	$52	$52	$49	$51	$50	$50
Other							
Fuel Price Hedge Value	$31	$42	$42	$47	$24	$44	$25
Generation Capacity Value	$22	$16	$17	$22	$19	$26	$18
T&D Capacity Value	$6	$1	$1	$3	$1	$8	$2
Market Price Reduction Value	$35	$67	$69	$54	$52	$51	$54
Environmental Value	$54	$55	$55	$52	$23	$22	$23
Economic Development Value	$44	$45	$45	$42	$45	$44	$45
(Solar Penetration Cost)	($23)	($23)	($23)	($22)	($23)	($22)	($22)
Total Other Value	$170	$203	$206	$199	$143	$173	$144
Total Value	**$282**	**$315**	**$318**	**$304**	**$257**	**$280**	**$256**

#	Value Component	Recommended Basis
1	Avoided Fuel Cost	Natural gas price projections
2	Avoided Variable Plant O&M Cost	MISO energy market costs: variable O&M portion

* Include avoided marginal energy line losses
- Avoided fuel cost based on natural gas projections
- Couple with a CT/CC assumption
  - Preferable to *black box* production modeling
- Consider tying avoided capacity costs to same CT/CC assumption
- MISO O&M works, but split by fixed & variable if possible

#	Value Component	Recommended Basis
8	Fuel Price Guarantee	Differential required to achieve 25 year flat NG price

- A guarantee goes well beyond a hedge
- Puts natural gas prices on same footing with solar *fuel* pricing
- Several ways to develop the guaranteed gas cost level
  - Formulaic
  - Utility-derived
- Risk must be on the utility to put guarantee into practice
- Year by year Δs with gas price projections; or simply use guaranteed NG price in total

#	Value Component	Recommended Basis
5	Avoided Transmission Capacity Cost	MISO OASIS transmission prices

- MISO transmission rates are posted on OASIS.
- Wholesale customers pay utility (NSP, MP, etc.) $/KW based on peak use.
- PV production reduces peak demand for transmission based on production at time of peak, i.e. capacity value.
- Savings based on average rate paid, rather than incremental transmission build.

Solar KW capacity on peak (KW ac)	1 KW x 50% (on peak)
x Annual Transmission Service rate ($/KW)	$45.64 per kW-yr
= $/ Solar KW	$22.82/solar kW-yr

$/ Solar KW	$22.82/solar kW-yr
÷ annual KWh	1,400 kWh/kW (est)
= $/ Solar KWH	1.63¢/kWh

#	Value Component	Recommended Basis
3	Avoided Generation Capacity Cost	Capacity value x generation capital cost
3a	Avoided Fixed Plant O&M Cost	MISO energy market costs: fixed O&M portion
4	Avoided Reserve Capacity Cost	Reserve margin criteria x generation capital cost
6	Avoided Distribution Capacity Cost	Distribution capital cost x local capacity value
10	Credit for High Value Distribution Locations	

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#	Value Component	Recommended Basis
7	Avoided Environmental Cost	Component by component

<u>Environmental value attributes should include:</u>

- **<u>Updated</u> real costs of fossil fuels - based on National Research Council data**
  - ❑ MN Statute 216B.2422, Subd. 3
  - ❑ $NO_{2,}$ SOx, $PM_{2.5}$ – Resource: "Health & Environmental Cost of Electricity Generation in Minnesota," Sept. 2013

- **Carbon**
  - **Federal Interagency Working Group Social Cost of Carbon**
    - Recommended by MN Pollution Control Agency in Xcel baseload diversification study of Sherco coal-fired power plant.
  - **<u>Updated</u> cost of carbon regulation compliance.**
    - Oct. 2012 Synapse Energy Economics study

- **Avoided costs from other conventional resource generation**

- **Regarding RECs.** Poor proxy for environmental value received from distributed solar. However, customers should receive compensation for RECs.

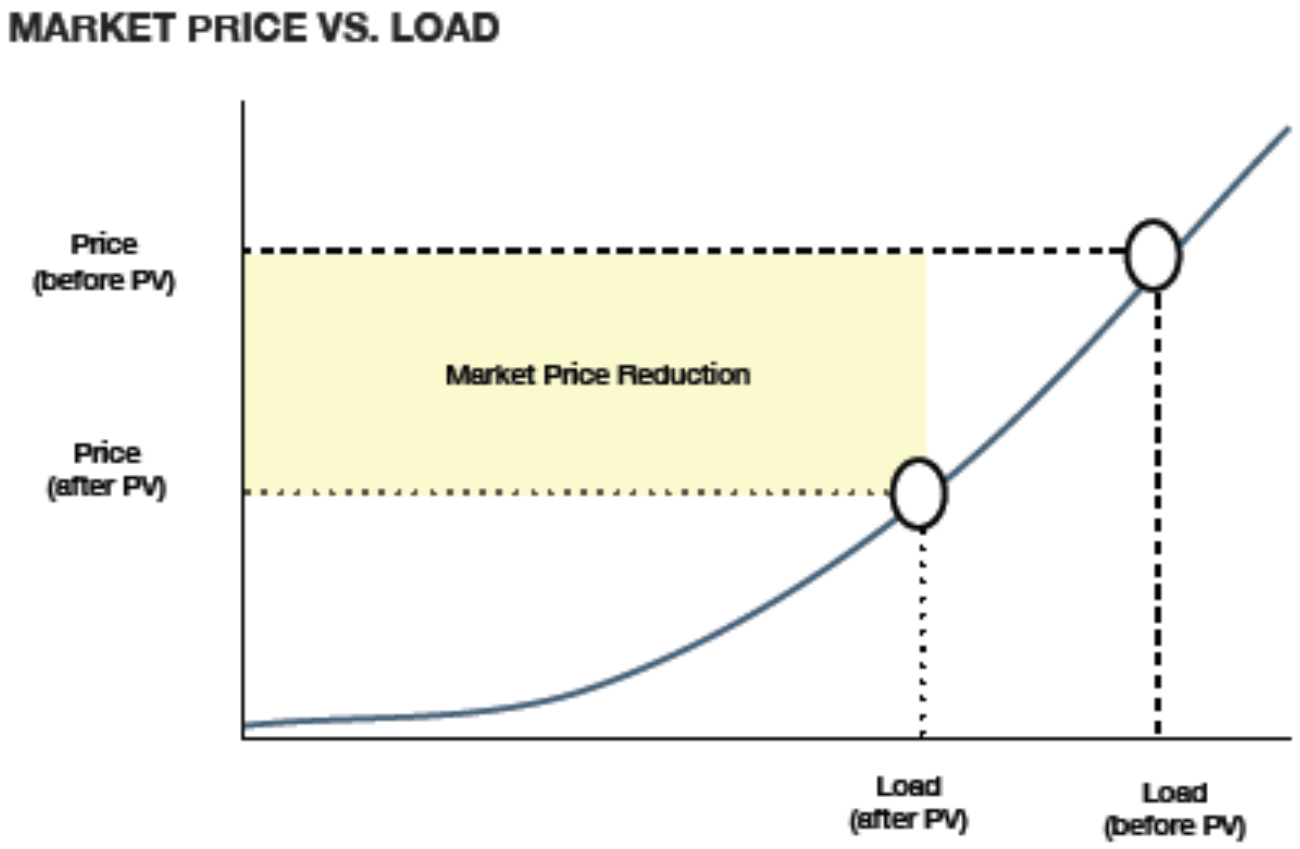
#	Value Component	Recommended Basis
9	Credit for local manufacturing and assembly	Local tax revenue tied to net solar jobs

- Minnesota economic benefits should be included because known and measurable
- Benefits largely societal, but utility benefit from increased economic activity in MN
- *Methodologies*
  - CPR: Local tax revenue tied to net solar jobs
    - San Antonio study a good methodology with conservative estimate

#	Value Component	Recommended Basis
11	Voltage Control	Placeholder for all ancillary services to be provided by advanced inverters

- The solar technology is available
  - "PV with advanced inverter can inject/consume VARs, adjusting to control voltage". (September 17, 2013 RMI presentation, at 76.)
- Utilities recognize this potential value
  - Distributed PV with storage, advanced inverters "may provide valuable grid support in the future" (Minnesota Power, supplemental comments)
- Utility may have to update its interconnection standards (*e.g.*, to qualify for VOST)
  - Currently, PV inverters set to trip off due to voltage excursion
- *Methodology*
  - Displaced voltage control, etc. costs

#	Value Component	Recommended Basis
12	Market Price Reduction	Wholesale power price reductions due to demand reductions



Source: September 17, 2013 RMI presentation, at 76.

#	Value Component	Recommended Basis
12	Market Price Reduction	Wholesale power price reductions due to demand reductions

- Price reduction applies to all wholesale energy purchases
  - Benefits accrue to utilities, ratepayers in general
- "[M]arket price suppression [may] exceed the direct cost savings when load is high." CPR (NJ/PA) 2012 at 36.
- *Methodology*
  - Calculate gross DRIPE (demand-reduction induced price effects) based on (1) existing load, (2) DPV-caused load reduction, and (3) wholesale price elasticity.
  - Potential load adjustment factor
  - Potential second-order effects

#	Value Component	Recommended Basis
13	Disaster Recovery	Cost to restore local economy

- The potential value solar PV can provide to ratepayers (and society) when circuits go down
  - or when circuits would have gone down *but for* DPV (acts as a load modulator during high peak demand)
  - aka "Security Enhancement Value"
- The solar technology is available
- Utility may have to update its interconnection standards (*e.g.*, to qualify for VOST).

#	Value Component	Recommended Basis
13	Disaster Recovery	Cost to restore local economy

Methodology

- CPR (NJ/PA) 2012: top down estimate
  - 5% of societal cost of annual outages (at 15% DPV penetration)
- <u>Alternative bottom-up approach:</u>
- In a multi-day grid-outage, all customers should have access to a functional:
  - grocery store, hardware store
  - health clinic, heat shelter
  - device charging locations, etc.
- Component value may vary by (1) location and (2) customer category.
- Compensation tied to heightened standard for interconnection and/or performance during an actual grid outage (per diem)?

Thanks

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